Thesis

TRANSMISSION NETWORK PLANNING USING GENETIC ALGORITHMS

By

M.T.A.P. Wickramarathna

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Declaration

The work submitted in this thesis is the result of my own investigations, except where otherwise stated.

It has not already been accepted in substance for any degree, and also is not being concurrently submitted for any other degrees.

Signed

MTAP Wickramarathna.
(Candidate)

Signed

Dr N Wickramarachchi.
(Supervisor)

Abstract

This project presents an application of Genetic Algorithm (GA) to solve Transmission Network Panning (TNP). The non-convexity that has been observed in the Transmission Network Planning cannot be solved effectively by conventional mathematical methods. GA has the ability to find the global optimal point in such a non-convex function.

It is recognized that the allocation of transmission costs in a competitive environment requires careful evaluation of alternative transmission network plans. As a result, the need for methods that are able to synthesize optimal transmission network plans has become more important than ever. Unfortunately, practice has shown that conventional optimization procedures are unable to produce optimal solutions for networks. The reason is that the transmission network planning problem is hard, large-scale combinatorial problem. The number of options to be analyzed increases exponentially with the size of the network.

The objective of TNP is to determine the installation plans of new facilities (lines & other network equipment) so that the resulting bulk power system may be able to meet the forecasted demand at the lowest cost, while satisfying prescribed technical, financial and reliability criteria. Although the conventional methods are somewhat successful in transmission network planning, some problems still exist:

1) Non-convexity (as described above): Therefore, the optimization process sometimes stops at non-optimal solutions.

2) Non-linearity: increases the iterations of the optimization algorithm and sometimes causes divergence.

As there are no fractional transmission lines, transmission network planning becomes a very complex mixed integer non-linear programming problem. GA can be used to select the optimal new transmission lines network with the least investment cost, while meeting the total load demands without any load curtailment.

The project done under the "Transmission Network Planning using Genetic Algorithm" has been successfully completed giving good results for the particular transmission network.

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